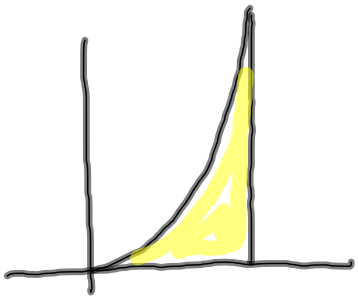
5.2 Riemann Sums, definite integrals



$y = x^2$

$a = 0$

$b = 1$

find the exact area

RRAM

$$\text{Exact area} = \lim_{\substack{n\to\infty \\ h\to 0}} \sum_{k=1}^{n} f(a + k\cdot h)\cdot h$$

$$h = \frac{b-a}{n}$$

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define $f(x) = x^2$

rram $(0, 1, n)$

$$\sum_{k=1}^{n} f(0 + k\cdot h)\cdot h \;\Big|\; h = \frac{1-0}{n}$$

$$\sum_{k=1}^{n} \left(\frac{k}{n}\right)^2 \frac{1}{n} =$$

$$\sum_{k=1}^{n} \frac{k^2}{h^3} = \frac{(n+1)(2n+1)}{6n^2}$$

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$$\lim_{n\to\infty} \frac{(n+1)(2n+1)}{6n^2} =$$

$$\lim_{n\to\infty} \frac{2n^2+3n+1}{6n^2} = \frac{1}{3}$$

exact area

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definite integral

$$\lim_{\substack{h\to 0 \\ n\to\infty}} \sum_{i=1}^{n} f(x_i)\cdot h = \int_a^b f(x)\,dx$$

exact area

$$\int_0^1 x^2\,dx = \frac{1}{3}$$

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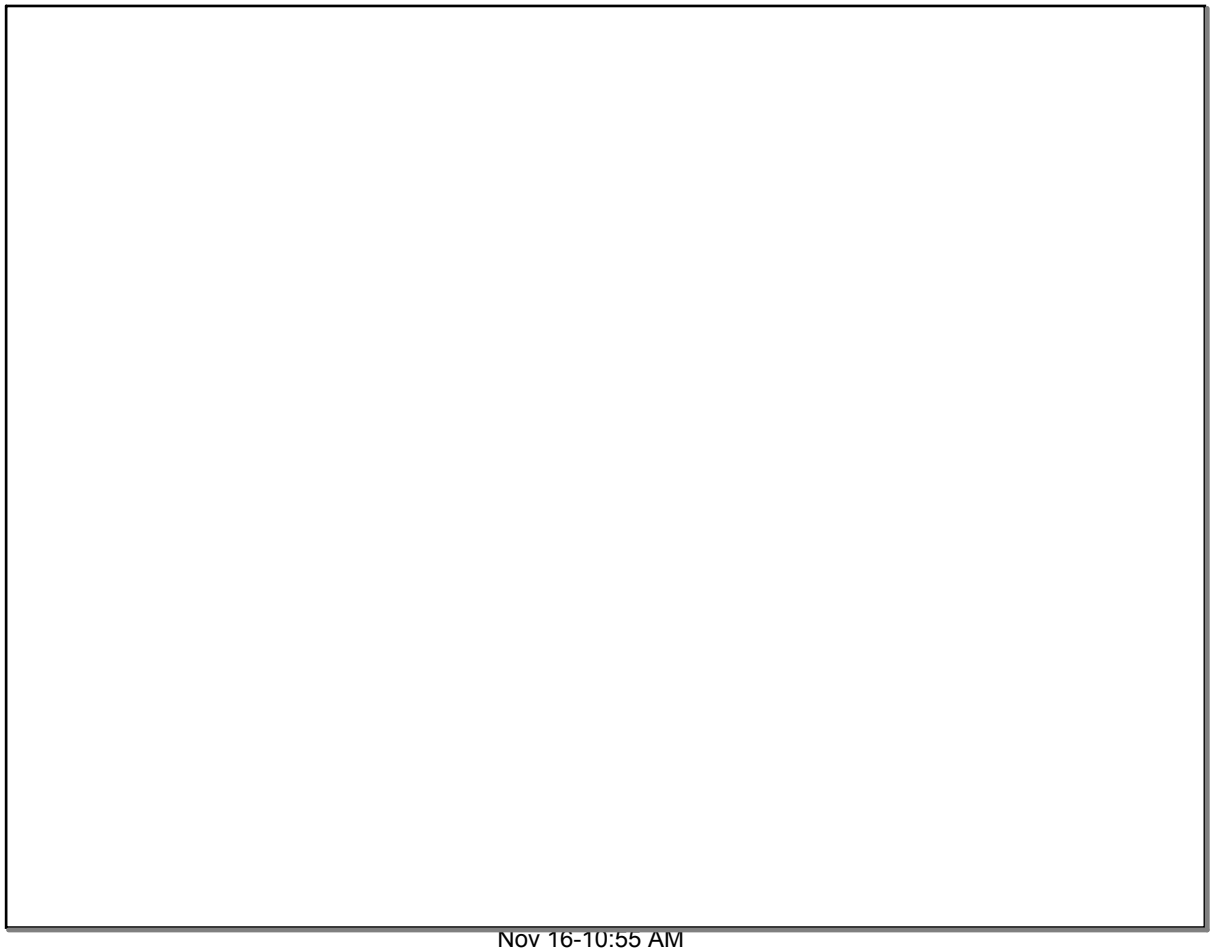

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